

INCH-POUND

MIL-PRF-22191E  
w/AMENDMENT 1

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## PERFORMANCE SPECIFICATION

### BARRIER MATERIALS, TRANSPARENT, FLEXIBLE, HEAT-SEALABLE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification establishes the requirements for transparent, flexible, heat-sealable barrier materials for use in military packaging (see 6.1).

1.2 Classification. The barrier materials are furnished in the following types and classes.

Type I – Waterproof, greaseproof, watervaporproof

Class 1 – Unlimited use

Class 2 – For use on automated bag making machines only.

Type II - Waterproof, greaseproof

Class 1 – Unlimited use

Class 2 – For use on automated bag making machines only.

Type III - Waterproof

Class 1 – Unlimited use

Class 2 – For use on automated bag making machines only.

#### 2. APPLICABLE DOCUMENTS

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8135

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2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

## STANDARDS

### FEDERAL

FED-STD-101	-	Test Procedures for Packaging Materials
FED-STD-595	-	Colors Used in Government Procurement

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

### AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC-Z1.4	-	Procedures, Sampling and Tables for Inspection by Attributes (DoD adopted)
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(Application for copies should be addressed to the American Society for Quality Control, P.O. Box 3005, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-D471 - Rubber Property-Effect of Liquids (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Qualification. The barrier materials furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.4).

3.2 Material. Barrier materials shall be made from such materials and by such processes as to ensure compliance with the performance requirements of this specification.

3.3 Construction. Barrier materials shall be constructed of one or more plies in any manner which ensures compliance with the performance requirements of this specification.

3.3.1 Splices. A roll shall not contain more than 3 splices (4 pieces) and each piece shall be not less than 45 yards in length. Splices within rolls shall be even the entire width of the roll material and shall not come apart during unwinding of the roll. Rolls containing splices shall be flagged at both ends of each splice with colored markers to indicate splices within the roll. Barrier material in flat cut sheets shall not contain splices (see 4.3.2.2).

3.4 Form. The barrier material shall be furnished in rolls or flat cut sheets as specified in the contract or delivery order (see 6.2).

3.4.1 Rolls. Unless otherwise specified (see 6.2), the width of roll material shall be 36 inches, with a tolerance of plus 1/4 inch or minus 1/8 inch. The average length of roll material shall be not less than 200 yards. The length of any individual roll shall be not less than 195 yards. The roll material shall be uniformly wound on nonreturnable cores. The core's inside diameter shall be not less than 3 inches, with a tolerance of plus 1/8 inch. The length of the core shall be equal to the width of the roll material, with a tolerance of plus 1/8 inch. The core shall be rigid to prevent distortion of the roll during use and shipment conditions. Each roll shall be restrained to prevent unwinding (see 4.3.2.2 and 4.3.2.3).

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3.4.2 Sheets. When flat cut sheets are specified, the length and width shall be as specified by the acquiring activity (see 6.2). If the length and width tolerances for cut sheets are not specified the tolerance for each shall be plus 1/4 inch or minus 1/8 inch (see 4.3.2.3). Flat cut sheets shall be evenly stacked (see 4.3.2.2).

3.5 Sealing. The material shall exhibit no delamination of the heat-sealed area when sealed according to the manufacturer's recommended conditions (see 4.5). Each roll or package (flat cuts) of barrier material shall include a tag secured to the core of rolls, or sheet inserted in the package of sheets with the sealing instructions for heat-sealing on rotary, band, and jaw type sealing equipment. The tag or sheet shall be visible upon opening the unit package (see 4.3.2.2).

3.6 Identification of material. The specification number, type, class, manufacturer's name, manufacturer's designation, month and year of manufacture, lot number, and the notation "Seal other Side" if applicable shall be clearly and legibly marked using water-resistant ink. The color of the markings shall conform to the blue of FED-STD-595, Color No. 15177, except the gloss requirement is not required (see 4.3.2.1). The complete markings shall be continuous lengthwise and the distance between groups of markings shall be not greater than 2 inches. A complete group of markings shall appear once in each 2 1/2 inches of width of the roll. The letters and figures shall be not less than 1/8 of an inch high (see 4.3.2.3).

3.7 Performance requirements. The performance of the barrier materials shall conform to the requirements specified in table I, when tested in accordance with 4.6.

3.8 Workmanship. Barrier material surfaces shall be free from any foreign matter. The barrier material edges shall be cut and trimmed of any selvage. Barrier material shall be free from holes, tears, cuts, sharp creases, wrinkles, or other imperfections (see 4.3.2.1).

TABLE I. Performance requirements.

Characteristics	Types I, II, III Requirements	Test Paragraph Reference
Thickness (inches)	0.006 (max)	4.6.1
Seam Strength		4.6.2
1. As received material sealed & tested:		
a. At room temperature (separation-inches)	No separation	
b. At 100 °F and at 160 °F (separation-inches)	No separation	

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TABLE I. Performance requirements – Continued.

Characteristics	Types I, II, III Requirements	Test Paragraph Reference
2. Sealed before aging at 160 °F for 12 days and tested: a. At room temperature (separation-inches) b. At 100 °F and at 160 °F (separation-inches) 3. Sealed after aging at 160 °F for 12 days and tested: a. At room temperature (separation-inches) b. At 100°F and at 160 °F (separation-inches)	No separation No separation No separation No separation	
Water Vapor Transmission Rate (WVTR) (Type I only) 1. After room temperature flexing: a. As received (gms/100 sq. in./24 hrs.) b. Aged (gms/100 sq. in./24 hrs.) (See 4.6.4) 2. WVTR after low temperature flexing: As received (gms/100 sq. in./24 hrs.)	0.03 (max) 0.03 (max) 0.03 (max)	4.6.1
Transparency a. As received b. After aging 12 days at 160 °F	Read lettering 3 inches behind material	4.6.1
Puncture resistance a. Type I b. Type II c. Type III	10 lbs (min) 8.0 lbs (min) 6.0 lbs (min)	4.6.1
Blocking resistance	No blocking delamination or rupture	4.6.1
Resistance to curl (Class I only)	Shall not curl in excess of 5 % or back on itself	4.6.1
Contact corrosivity	No corrosion, etching or pitting	4.6.1
Oil resistance (delamination) (multi-ply materials only)	No leakage, swelling, delamination, or embrittlement	4.6.1
Waterproofness (Type II and Type III only)	No dye penetration	4.6.5
Aging resistance (Multi-ply materials only)	No delamination	4.6.4
Water resistance of marking	Markings are clear and legible	4.6.1
Seam fabrication	No leakage at double seam junction	4.6.3
Marking abrasion resistance	Shall not smear or blur	4.6.6

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TABLE I. Performance requirements – Continued.

Characteristics	Types I, II, III Requirements	Test Paragraph Reference
Storage stability: 1. Seam strength, as received at room temperature. 2. Oil resistance, multi-ply material only.  3. Transparency, as received only.  4. Water vapor transmission rate after room temperature flexing: a. As received (gms/100sq. in./24 hrs.) b. Aged (gms/100 sq. in./24 hrs.)	No separation No leakage, swelling, delamination, or embrittlement Read lettering 3 inches behind material.    0.03 (max) 0.03 (max)	4.6.7

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. The qualification inspection shall consist of all tests and examinations of this specification.

4.3 Conformance inspection. Conformance inspections consist of the required tests listed in table II and the examinations listed in tables III through V.

TABLE II. Conformance tests.

Characteristics	Paragraph Reference
Seam strength (room temperature only)	--
As received	4.6.2.2
Sealed before aging	4.6.2.3
Sealed after aging	4.6.2.4
Seam fabrication	4.6.3
Water vapor transmission rate (as received only)	4.6.1
Puncture resistance	4.6.1
Blocking resistance	4.6.1

TABLE II. Conformance tests - continued.

Characteristics	Paragraph Reference
Resistance to curl (class 1 only)	4.6.1
Oil resistance (delamination)	4.6.1
Water resistance of marking	4.6.1
Transparency	4.6.1
Waterproofness (type II and type III only)	4.6.5

4.3.1 Sampling for conformance inspection. Unless otherwise indicated, sampling for inspection shall be performed in accordance with the provisions set forth in ASQC-Z1.4.

4.3.2 Examination of the end item. For the purpose of determining the sample size in accordance with ASQC-Z1.4, the lot size shall be expressed in units of rolls or packages of sheets, as applicable, for examinations under 4.3.2.1 through 4.3.2.3, inclusive.

4.3.2.1 Examination of the end item for defects in appearance, construction, and workmanship. For examination of defects within rolls, the sample unit of product shall be two yards, the full width of the roll. For examination of sheets, the sample unit shall be two sheets randomly selected from a package. No more than five sample units, randomly selected, shall be drawn from any one roll or package of sheets, as applicable. Both sides of the material shall be examined.

TABLE III. Examination of end item for defects in appearance, construction, and workmanship.

EXAMINATION	DEFECT
Form	Not roll or flat cut, as specified. Incorrect type or class of material.
Appearance	Surfaces not clean; presence of any foreign matter, dirt, sand, grit, or oil spots. (Note: Defects do not apply to outer convolution of roll.)
Workmanship	Blister, crack, cut, hole, tear, sharp crease or wrinkle, chafed spot, or scuff mark. (Note: Defects do not apply to outer convolution of roll.) Evidence of delamination or embrittlement. Edges not clean cut; ragged, crushed, or uneven.
Construction	Not uniform; layer or section missing, selvage present.
Identification markings	Illegible, incorrect, incomplete, or omitted. Do not appear on backing surface of material if applicable; not continuous lengthwise. Color is not blue.

4.3.2.2 Examination of the end item for defects in general construction. The sample unit for this examination shall be one roll or one package of sheets, as applicable.

TABLE IV. Examination of end item for defects in general construction.

EXAMINATION	DEFECT
Assembly of sheets	Not evenly and uniformly stacked; sheet containing manufacturer's sealing conditions not visible upon opening. Adjacent sheets stick together to the extent that separation causes tearing or injury to any surface. Splice within sheet.
Assembly of roll	Not restrained to prevent unwinding. Material not wound uniformly on roll causing soft or uneven edges, or telescoping of roll. Material not wound on a rigid core, core broken, collapsed, crushed, mutilated.
Unwinding of roll (check both sides)	When unwound, material sticks together to the extent that unrolling causes tearing or injury to any surface. Material wound unevenly causing wrinkles, sharp creases, or folds within roll. Roll not continuous; more than 3 splices (4 pieces) in roll or more than 1 splice in any 50 consecutive yards. Splice(s) not evenly made; does not cover entire width of material; comes apart during unwinding of roll.
Sealing instructions	Manufacturer's instructions for sealing conditions of the material not attached to core of roll.

4.3.2.3 Examination of the end item for dimensional defects. The sample unit for this examination shall be one roll or one package of sheets, as applicable.

TABLE V. Examination of the end item for dimensional defects.

EXAMINATION	DEFECT
Sheets	Length or width varies by more than minus 1/8 inch or plus 1/4 inch from the dimensions specified.
Rolls: Width	Varies by more than minus 1/8 inch or plus 1/4 inch from width specified.
Length	Average length of roll material is less than 200 yards. The length of any individual roll is less than 195 yards.



TABLE V. Examination of the end item for dimensional defects - Continued.

EXAMINATION	DEFECT
Core	Length less than width of roll material, or greater by more than plus 1/8 inch. Inside diameter less than 3 inches or greater than 3 1/8 inches
Identification markings	Lettering is less than 1/8 inch in height. Do not appear once in each 2 1/2 inches of width of roll. The complete group does not appear every 2 inches lengthwise

4.4 Test conditions. Unless otherwise specified in the detail test methods herein, the physical tests contained in this specification shall be made with an atmosphere having a relative humidity of  $50 \pm 5$  percent and a temperature ranging from 70 to 76 °F. Material shall be considered in equilibrium after exposure to the above conditions for a minimum of 24-hours.

#### 4.5 Sealing instructions for qualification and conformance testing.

a. All seals for test purposes shall be not less than 1/2-inch wide and shall be effected on a jaw-type heat-sealer (or equivalent as approved by the qualifying activity) utilizing the sealing conditions recommended by the manufacturer. The upper sealing conditions for production line sealing operations with respect to commercially available sealing equipment and commercially practical fabrication time are a temperature setting of 525 °F, a 3-second dwell time, and a pressure of 60 pounds per square inch (see 6.3).

b. Impulse seals for test purposes shall be a minimum of 1/16-inch wide and shall be effected on impulse sealers, or equivalent as approved by the qualifying activity. The upper sealing limits on the sealer shall effect a seal and not cause thinning at the inside edges of the seal.

c. In the securing of the three 1-inch seam strength specimens from their respective samples (see 4.6.2.2.1), specimens shall not be removed:

- (1) From points in the sealed sample where seal overlapping has occurred.
- (2) From points in the sealed sample that were within 1-inch of either end of the sealer jaw during the sealing operation.

#### 4.6 Verification of performance requirements.

4.6.1 Test methods. Unless otherwise specified, the tests in table VI shall be conducted in accordance with the identified methods of FED-STD-101.

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TABLE VI. Test methods.

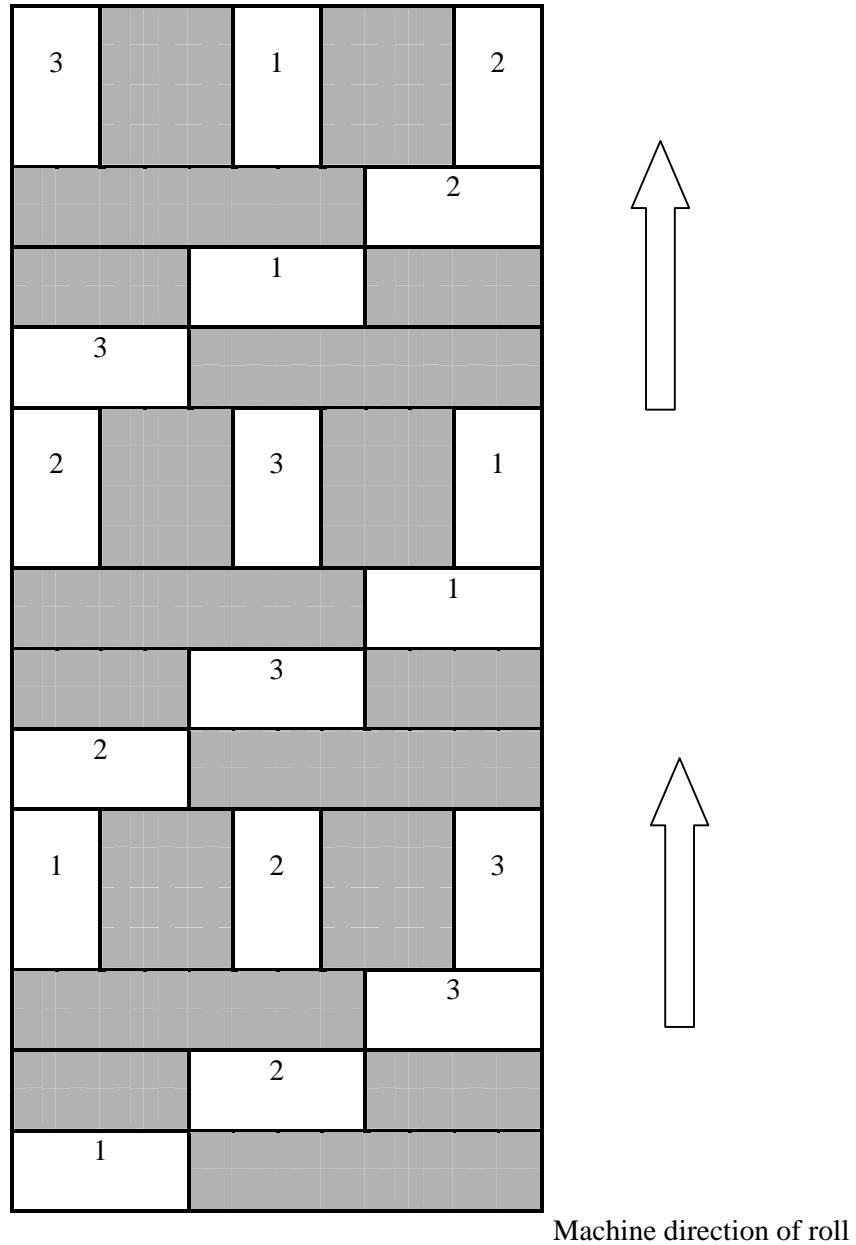
Tests	FED-STD-101 Test Method No	Special Requirement or Exception Note
Water vapor transmission rate After room temperature flexing (type I only) (as received & aged)	2017	----
Transmission rate procedure	3030 procedure A(1)	
Water vapor transmission rate After low temperature flexing (type I only) (as received)	2017	<u>1</u> /
Transmission rate procedure	3030 procedure A(1)	
Thickness	1003	
Puncture resistance	2065	<u>2</u> /
Blocking resistance	3003 procedure D	
Resistance to curl	2015	
Contact corrosivity	3005	<u>3</u> /
Oil resistance (multi-ply materials only)	3015	<u>4</u> /
Water resistance of marking	3027	<u>5</u> /
Transparency	4034	---

NOTES:

- 1/ Conduct tests as specified in FED-STD-101, Method 2017 except that only ‘as received’ specimens shall be tested. Prior to flexing, test specimens shall be conditioned for at least 30 minutes at  $-20 \pm 2$  °F and the flexing operation shall be conducted at  $-20 \pm 2$  °F.
- 2/ Elongation test data shall not be required.
- 3/ If corrosion is evident in the blank area, the test shall be repeated with a new test panel. Corrosion in the intermediate area shall not invalidate the test nor be cause for rejection.
- 4/ Oil conforming to ASTM oil number 3, as specified in ASTM-D471, and a di-2-ethylhexyl sebacate synthetic oil shall both be used.
- 5/ Three specimens shall be tested, each one containing a complete set of markings.

4.6.2 Seam strength.

4.6.2.1 Seam strength samples. Samples measuring 6 by 12 inches shall be selected from the test material as shown on figure 1. Samples shall be drawn in duplicate.



**KEY**

- 1 - 6 inch by 12 inch sample for “As Received” testing
- 2 - 6 inch by 12 inch sample for “Sealed before Aging” testing
- 3 - 6 inch by 12 inch sample for “Sealed after Aging” testing

FIGURE 1. Sampling method for seam strength test.

#### 4.6.2.2 Seam strength “as received”.

4.6.2.2.1 Preparation of test specimen. The twelve specimens for this test shall be folded in half with the crease parallel to the long axis. The open or unfolded length shall be sealed. One set of samples shall be heat-sealed the other set shall be impulse sealed. The sealed areas shall be indicated by a line drawn on the back of the specimen while the specimen is in the sealer. The line shall be drawn along the sealer jaw with a sharp graphite pencil. The folded length shall be cut off 1/2 inch from the end. From each of the twelve sections, three adjacent 1-inch-wide specimens shall be cut perpendicular to the seam (see 4.5). One of the specimens from each section shall be used for test at room temperature, one from each section for test at 100 °F, and the remaining one from each section for test at 160 °F. After sealing and prior to the application of the specified weights, the specimens in all cases shall be exposed for one hour to the test conditions specified in 4.4.

4.6.2.2.2 Test at room temperature. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.2.1) shall be opened and one end of each specimen shall be clamped so that the other end of the specimen hangs freely. A 3 1/2 pound weight  $\pm$  1/2 ounce shall then be carefully attached to the free end of the specimen so as not to impact load the seal. The weight shall be allowed to act for 5 minutes, whereupon the weight shall be removed and the specimen examined for separation of the sealed faces. Any evidence of delamination of one ply away from the other in the sealed area shall be cause for rejection. The evaluation shall be limited to the sealed area specified in 4.6.2.2.1.

4.6.2.2.3 Test at 100 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.2.1) shall be tested the same as those specimens tested at room temperature except that specimens shall be clamped in a forced draft circulating air oven maintained at  $100 \pm 2$  °F with a weight of 2 pounds  $\pm$  1/2 ounce acting on the free end of the specimen for 1 hour. The rate of air circulation shall be held to the minimum required to maintain uniform temperature throughout the oven. In no case shall the rate of air circulation cause any movement of the weighted specimens. The weights shall be attached after the specimens and test clamp fixtures have been placed in the oven. The weights shall be removed prior to taking the specimen from the oven in order to avoid excessive loading due to swaying action. After one hour, the weights shall be removed and the specimen examined for separation of the sealed faces. Any evidence of delamination of one ply away from the other in the sealed area specified in 4.6.2.2.1 shall be cause for rejection.

4.6.2.2.4 Test at 160 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.2.1) shall be tested the same as those at 100 °F except that the weight shall be  $10 \pm 1/2$  ounce, and the temperature in the forced draft circulating air oven shall be  $160 \pm 2$  °F. The rate of air circulation shall be held to the minimum required to maintain uniform temperature throughout the oven. In no case shall the rate of air circulation be such as to cause any movement of the weighted specimens.

4.6.2.3 Seam strength (sealed before aging).

4.6.2.3.1 Test specimens. The twelve 1-inch-wide specimens for this test shall be folded in half with the crease parallel to the long axis. The open or unfolded length shall be sealed by clamping in the sealer and simultaneously drawing a sharp penciled line on the backing along the edge of the sealer jaw. This line identifies the actual seam separation. The folded length of the test section shall then be cut off 1/2 inch from the end. After sealing, the samples shall be aged in a circulating air oven maintained at  $160 \pm 2$  °F for 12 consecutive days (288 hours). After aging, 1-inch-wide specimens, as specified in 4.6.2.2.1, shall be cut from the sections for test at room temperature, 100 °F, and 160 °F.

4.6.2.3.2 Test at room temperature. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.3.1) shall be tested as specified in 4.6.2.2.2.

4.6.2.3.3 Test at 100 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.3.1) shall be tested as specified in 4.6.2.2.3.

4.6.2.3.4 Test at 160 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.3.1) shall be tested as specified in 4.6.2.2.4.

4.6.2.4 Seam strength (sealed after aging).

4.6.2.4.1 Test specimens. The twelve 1-inch-wide specimens for this test, in the flat unsealed condition as taken from the sample roll shall be aged in a circulating air oven maintained at  $160 \pm 2$  °F for 12 consecutive days (288 hours). After removal from the oven, the unsealed sections shall return to room temperature. Test specimens shall then be obtained as specified in 4.6.2.2.1.

4.6.2.4.2 Test at room temperature. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.4.1) shall be tested as specified in 4.6.2.2.2.

4.6.2.4.3 Test at 100 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.4.1) shall be tested as specified in 4.6.2.2.3.

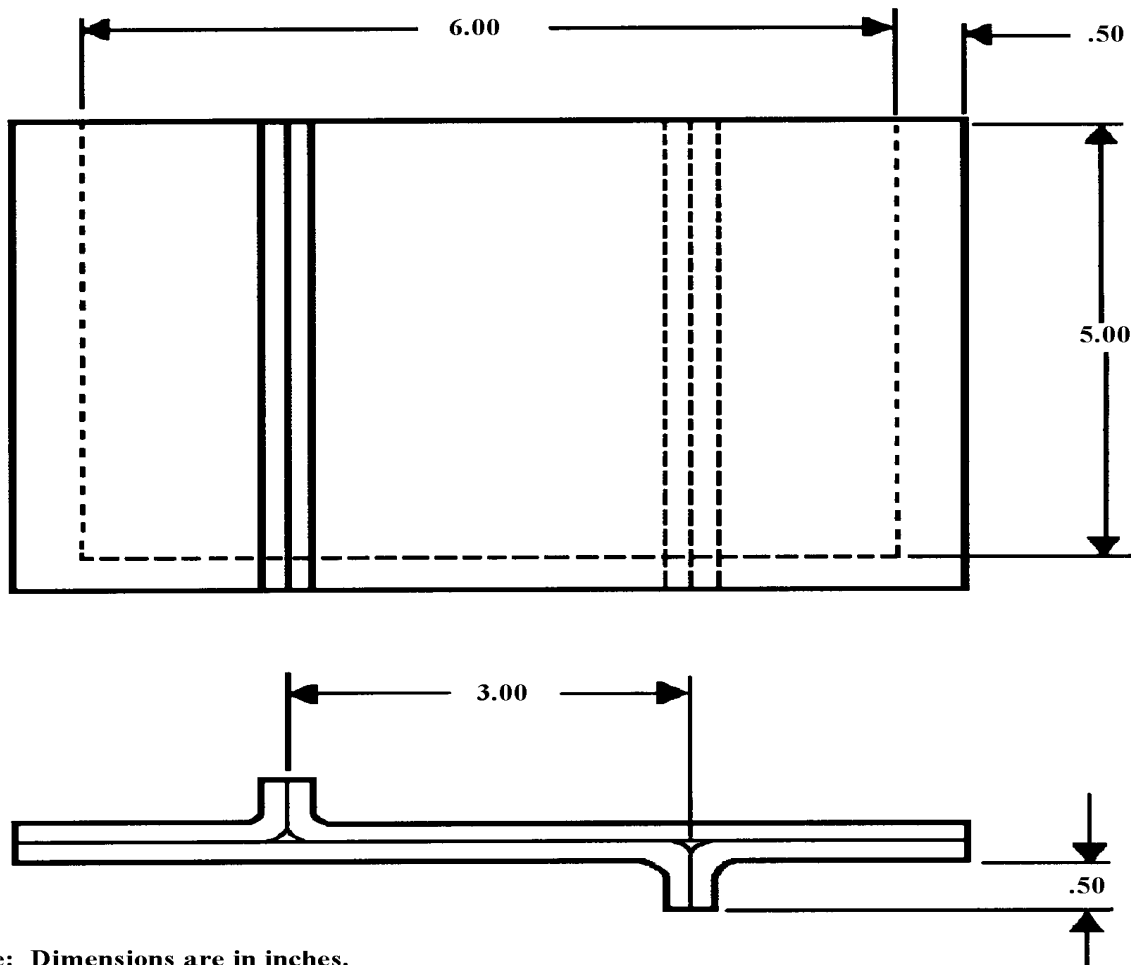
4.6.2.4.4 Test at 160 °F. The twelve 1-inch-wide specimens selected for this test (see 4.6.2.4.1) shall be tested as specified in 4.6.2.2.4.

4.6.3 Seam fabrication.

4.6.3.1 Preparation of test specimens. Four pouches sealed in accordance with the manufacturer's recommended sealing conditions shall be fabricated from the barrier material. Each pouch shall be prepared by cutting four specimens; two 2 1/2 by 5 1/2 inches and two

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5 1/2 inches by 5 1/2 inches. The pouch shall be fabricated by sealing as shown on figure 2. The butt seals projecting at 1/2-inch seams perpendicular to the faces shall be made prior to sealing the bottom. The butt seals shall be folded flat at the point of juncture with the bottom seams before the bottom seals are made.



**Note:** Dimensions are in inches.

FIGURE 2. Pouch for seam fabrication test.

4.6.3.2 Procedure. A water solution, containing dye and a 1 percent Aerosol O.T. (Dioctyl Sodium Sulfosuccinate) or equivalent as approved by the qualifying activity, shall be made to produce a distinct color. The solution shall be poured into each sealed pouch to a level of two inches above the top of the bottom seam. The pouch shall then be suspended vertically. After a period of 15 minutes at room temperature, the pouches shall be examined for dye leakage at all seams and especially at the double seam junctions (the points where the vertical seams intersect the bottom seam at points other than at the corners of the pouch).

4.6.4 Aging resistance (multi-ply materials only). Three specimens, 36 by 6 inches, cut from across the roll of material, at points which shall be not less than 1 yard apart, shall be used for this test.

4.6.4.1 Procedure. The specimens shall be subjected to the following aging cycle:

8 hours in a humidity chamber of  $100 \pm 2$  °F and 90 to 95 percent relative humidity.  
16 hours in a circulating air oven at  $160 \pm 2$  °F.

The aging cycle shall be repeated every weekday, for five consecutive days. The specimens shall remain in the circulating air oven maintained at the conditions described above on Saturday, Sunday and holidays, except that holidays shall not exceed a total of two days over the entire aging period. The aging procedure shall continue for fourteen consecutive days. The specimens shall be folded loosely, hung, rolled loosely, or laid flat in the test chamber during the aging period. At the conclusion of the aging period the specimens shall be returned to room temperature and examined, particularly at all edges, for delamination brought about by the aging exposure. No supplemental attempt to delaminate the material, such as prying or picking at the plies, shall be carried out. For purposes of this test, delamination shall occur if ply separation at any one given point extending in more than 1/2 inch from the edge with an edge length separation greater than 1 inch.

4.6.5 Waterproofness (Type II and Type III). Prepare test specimens as specified in FED-STD-101, Method 2017, except that only unaged samples shall be tested. Prior to flexing, test specimens shall be conditioned for at least 30 minutes at  $-20 \pm 2$  °F and the flexing operation shall be conducted at  $-20 \pm 2$  °F.

4.6.5.1 Procedure. After flexing the specimen, the sleeve shall be removed, and allowed to come to room temperature and dried by wiping with absorbent material or by placing in a circulating air oven maintained at 160 °F for ten minutes. The sleeve shall then be made into a pouch by sealing one of the open ends. The pouch shall be filled with shredded absorbent paper and shall be placed in a water solution containing 1 percent O.T. and methyl violet for ten minutes. The pouch shall then be removed, wiped dry, and the shredded absorbent paper examined for dye stain.

4.6.6 Marking abrasion resistance.

4.6.6.1 Preparation of test specimens. Strips 3-inches-wide containing marking shall be cut so that the amount of marking shall be at maximum. The length shall allow that after a bifold seam is formed and stapled, the resultant strip shall be 3 inches wide by 18 inches long as shown on figure 3.

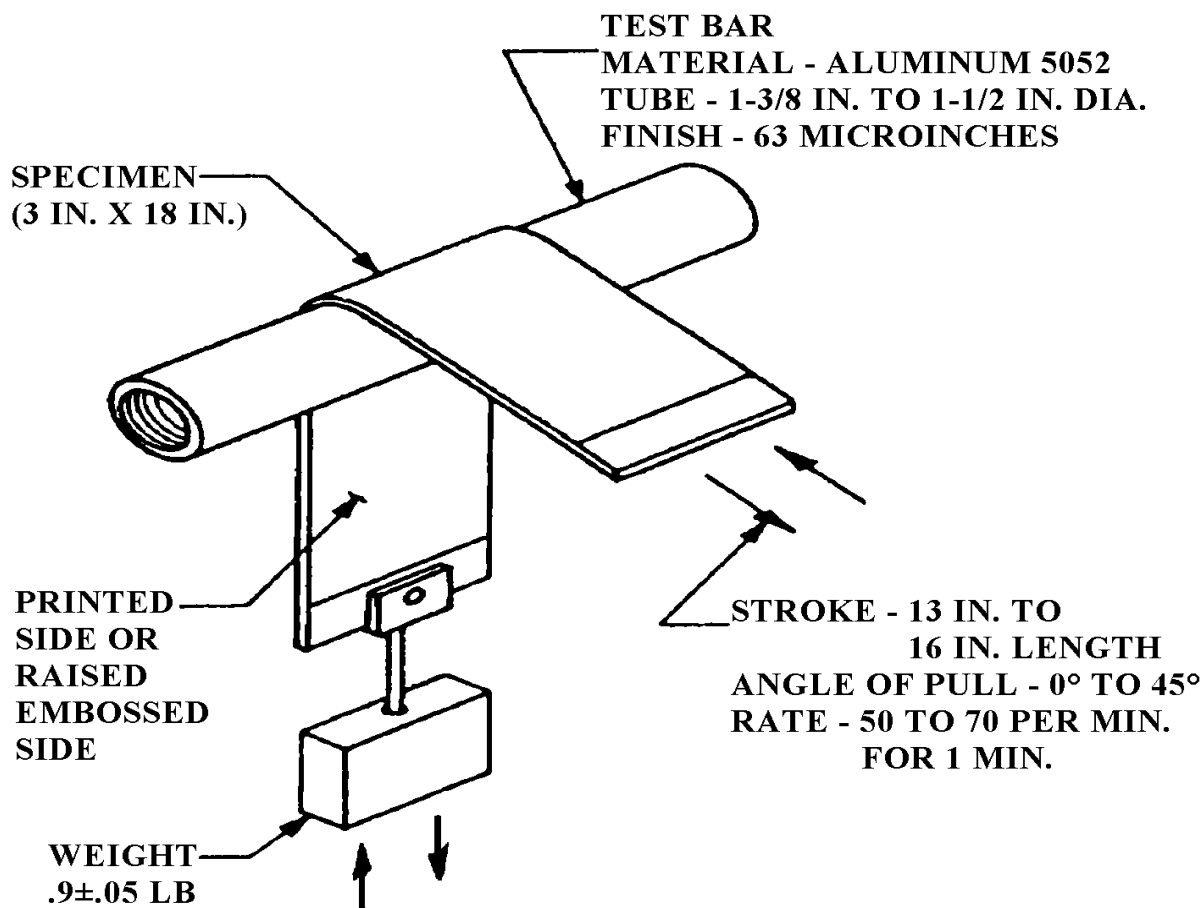


FIGURE 3. Apparatus for testing identity markings resistance to abrasion.

4.6.6.2 Procedure. The test bar shall be a hollow 5052 aluminum 1 1/2 inch diameter tube with a number 63 finish. The strip shall be hung over the bar with  $0.9 \pm 0.5$  pound weight attached to one end as shown on figure 3. The side with the print or raised embossing shall be in contact with the bar. The other end shall be pulled (stroked) at a rate of 50 to 70 strokes per minute for 1 minute. The stroke length shall be 13 to 16 inches. The angle of pull (stroke) shall be from 0 to 45 degrees. The strip shall be removed and the weight detached. The printing shall be examined for legibility, smear, and blurring.



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4.6.7 Storage stability. After one year of sheltered storage at  $75 \pm 2$  °F and  $50 \pm 5$  percent relative humidity, a roll of material (or package of sheets, if applicable) shall be tested for conformance to the requirements of the following tests:

Seam strength at room temperature (no accelerated aging required).

Oil resistance (multi-ply materials only).

Transparency (accelerated aging not required).

Watervapor transmission rate after room temperature flexing (as received and aged), type I only.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The barrier materials covered by this specification are intended for use in specialized military methods of preservation. The combination of all performance characteristics of MIL-PRF-22191; water vapor transmission rate; transparency; contact corrosivity; storage stability; seam strength and fabrication; puncture, aging, blocking, and curl resistance; delamination; waterproofness; water resistance of markings provide the necessary requirements for protection from exposure to the extremes of the navy/naval aviation environment. Navy/naval aviation items are exposed to high moisture, high salt concentration, transfer at sea, rough handling, and minimal storage conditions. There are no commercial equivalents that meet the physical, mechanical, and corrosion requirements necessary to protect materiel that is exposed to the operational naval aviation environment. Specifically, Methods of Preservation 31, 32, 33, 41 and 51 of MIL-STD-2073-1C use MIL-PRF-22191 as the premier source of barrier materials that is transparent and provides waterproof and watervaporproof (and watervaporproof with desiccant) protection for

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applicable items encountering the above conditions. MIL-PRF-22191 provides the building blocks for applying specialized military preservation techniques approved under MIL-STD-2073-1C.

6.1.1 Type I use. Type I material is intended to be used in all packaging applications where watervaporproof, greaseproof barrier materials are required.

6.1.2 Type II use. Type II material is intended to be used in all packaging applications where waterproof, greaseproof barrier materials are required.

6.1.3 Type III use. Type III material is intended to be used in all packaging applications where waterproof barrier materials are required.

6.1.4 Class designation. A class system has been established in order to distinguish between materials which do, and do not curl. Class 1 material has unlimited use and is used for the fabrication of bags by manual sealing methods or by automated bag making machines. Class 2 material is used for the fabrication of bags only by automated bag making machines.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).
- c. Type and class of barrier material (see 1.2).
- d. Form (rolls or flat cut) and size required (see 3.4).
- e. Packaging requirements (see 5.1).

6.3 Heat-seal equipment. It is not intended that the operating temperature of heat-sealing equipment be limited to 525 °F or less. While equipment may be operated at temperatures exceeding 525 °F to accomplish a seal, the barrier material must also be capable of being heat-sealed at temperatures of 525 °F or less.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-22191 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products and

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the letter of authorization for submittal of sample may be obtained from: Commander, Naval Air Warfare Center Aircraft Division, Code 4.3.5.3, Building 562-3, Highway 547, Lakehurst, NJ 08733-5049.

Barrier material supplied under contract should be identical in every respect to the samples tested and found to meet the requirements of this specification. Any unapproved changes from the qualification sample should constitute cause for rejection for material submitted and for removal from the list of qualified products. However, acceptability under this specification is based on the performance characteristics of the barrier material, and since there is no color requirement, it is not mandatory that the color of the visible surfaces of the material supplied under contract be the same as the samples tested and accepted by the qualifying activity.

6.4.1 Submission of qualification samples and additional information. Prior to submitting samples for qualification testing, vendors will request authorization from the qualifying activity. Upon receipt of authorization, samples will be forwarded as directed. The qualifying activity will require the manufacturer to submit for review and approval, two copies of the manufacturer's test report, including the sample's material safety data sheet (MSDS) (see 6.6), the location and identity of the plant which produced the sample, and the item composition report. The samples should be plainly and durably marked with the following information:

### Sample for Qualification Inspection

BARRIER MATERIAL, TRANSPARENT, FLEXIBLE, HEAT-SEALABLE

Manufacturer's Name

Manufacturer's Code No.

Type

Class

Date of manufacture (month and year)

Submitted by (name) (date) for qualification inspection in accordance with requirements of MIL-PRF-22191E under authorization (reference authorizing letter)

6.5 Conformance inspection lot. For purposes of sampling, an inspection lot for examinations and tests should consist of all material of the same class made by the same process from the same components by one manufacturer and submitted for delivery at one time.

6.6 Material Safety Data Sheets (MSDSs). Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313; and 29 CFR 1910.1200 requires that the Material Safety Data Sheet for each

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hazardous chemical used in an operation must be readily available to personnel using the material. Contracting officers will identify the activities requiring copies of the Material Safety Data Sheet.

6.7 Metric conversion factors. Metric conversion factors are referenced in FED-STD-376.

6.8 Subject term (key word) listing.

Bags  
Greaseproof  
Packaging  
Preservation  
Water vapor transmission

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.10 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

## CONCLUDING MATERIAL

Custodians:  
Army - GL  
Navy - AS  
Air Force - 11

Preparing activity:  
Navy - AS  
(Project 8135-0751)

Review Activities:  
Army - AT, CR4, EA, MI, SM  
Navy - MC, OS, SA, SH, YD  
DLA - CC, SS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at <http://www.dodssp.daps.mil>.